in the Presence of Mercury or Chloroform," by M. E. Rehfuss and P. B. Hawk. Neither mercuric chloride nor chloroform interferes with Nylander's test for sugar performed in the manner described by these authors. "A Study of Nylander's Reaction," by M. E. Rehfuss and P. B. Hawk. A study of various methods of performing the test, its delicacy, the effects of temperature and the influence of a variety of substances upon it (drugs and urinary constituents). "Effects of Soluble Salts upon Insoluble Phosphates," by J. E. Greaves. Various salts such as sulphates, chlorides, nitrates of sodium, calcium, ammonium or magnesium may increase the solubility of the insoluble phosphates and so indirectly affect the growth of plants.

BOTANICAL NOTES

PAPERS ON TREES

THREE papers upon the hawthorns (*Crataegus*) have come to hand during the past few months. The first by W. W. Eggleston—"The Crataegi of Mexico and Central America" (*Torrey Bull.*, 1909)—describes the wild species and varieties of these countries, ten in number, of which four species and two varieties are here named for the first time. The author remarks that "the genus *Crataegus*, south of the United States, seems confined to the tablelands of Mexico, and southward through the highlands of the Andes. In Mexico the fruit is of much economic importance, being often found in the markets, and the trees are guarded as carefully as other fruit trees are with us."

The same author in a later number of the *Torrey Bulletin* under the title "New North American Crataegi," describes three new species from (1) Texas, (2) North Carolina, eastern Tennessee and southern Virginia and (3) Montana.

Professor Sargent has been studying the "American Crataegi in the *Species Plantarum* of Linnaeus" (in *Rhodora*, 1909) in the Plukenet Herbarium (British Museum), and in the Linnaean Herbarium. *Crataegus viridis* is identical with *C. viridis* of the southeastern United States. *C. crus-galli* can not certainly be identified with any of our species. Of *C. tomentosa* he says "it is not possible to guess even at the plant described by Linnaeus" under this name. *C. coccinea* is in such confusion that Professor Sargent abandons the name, and substitutes for it the name *C. rotundifolia*, var. *pubera*.

Ivar Tidestrom's "Notes on Populus, Plinius" (in *Midland Naturalist*, 1909) attempts to distinguish *Populus alba, P. canescens* and *P. alba bolleana*. His discussions and descriptions are made plainer by two plates.

Before leaving Vermont for Wisconsin Professor L. R. Jones completed with the aid of F. V. Rand a most useful paper on "Vermont Shrubs and Woody Vines" (Bull. 145, Vermont Experiment Station), including figures and descriptions of the smaller woody plants of his state. He enumerates 135 species, and this does not include any species of *Crataegus*, this genus being passed over with only a characterization of the "groups." The excellent and life-like cuts (by Mary Robinson) enable one to follow the text descriptions very easily. We wish here to record our conviction that bulletins of this kind, although not "agricultural" in the narrower sense, are very properly included among the publications of the Agricultural Experiment Stations, since they bring to all who are interested in trees and shrubs much information which must lie at the foundation of many "practical" investigations.

Professor Shimek discusses "A Hybrid Oak" (in *Proc. Iowa Academy of Sciences*, 1909) and by comparisons and figures shows it to be pretty certainly a hybrid of *Quercus imbricaria* and *Q. palustris*.

Allied somewhat remotely to the foregoing papers is H. H. Bartlett's article on "The Submarine Chamaecyparis Bog at Woods Hole, Massachusetts," in *Rhodora*, December, 1909. A photograph shows well the roots of trees that once grew at levels now covered at high tide.

Professor Shimek read a paper on "The Relation of Forestry to Engineering" early in

1909 before the Iowa Engineering Society (published in the *Proceedings* of the Society) which is a vigorous defense of the contention of the foresters that forests conserve the rainfall in such a manner as to materially affect stream flow. Beginning as a defense, the writer rapidly pushes his discussion into a smashing criticism of recent statements made in certain quarters as to the inefficiency of forests in holding back and lessening floods. The paper should be widely read at this time when concerted assaults are being made upon the efficiency of the forest cover.

Here we may notice Professor Bray's bulletin on "The Mistletoe Pest in the Southwest" (Bull. 166, Bureau of Plant Industry, U. S. Department of Agriculture). From it we learn that the American mistletoe (*Phoradendron flavescens*) extends through the southern states across Texas, New Mexico and Arizona to southern California, thence northward in the coast region to Oregon and Washington. In the east its northern limit is New Jersey, southern Pennsylvania to southern Illinois, Missouri and eastern Oklahoma. In Texas it attacks species of *Hicoria, Quercus, Ulmus. Celtis, Toxylon, Morus, Sassafras, Acacia, Prosopis, Gleditsia, Xanthoxylum, Melia, Sapindus, Nyssa, Diospyros, Fraxinus* and *Tecoma.* In commenting on this matter the author says: "It is a question whether any tree is wholly immune to attacks from the mistletoe." Much space is given to a discussion of the eradication of the pest. Two plates and several text illustrations add to the value of the bulletin.

Professor F. J. Phillips makes a valuable contribution to our knowledge of a peculiar injury to forest trees—namely, that due to hail-storms, in a recent paper—"Hail Injury on Forest Trees" (*Trans. Acad. Sci. St. Louis,* XIX., 3). By means of photographs the author shows the extent of the injury (often very great) to many kinds of trees. The direct injury is often supplemented by the advent of boring insects and wood-destroying fungi. Catalpa suffers the most, probably on account of its large leaves and somewhat succulent bark. Osage orange endures hail better than any other of the broad-leaved trees.

PLANT BREEDING

THAT the breeding of plants has become a reality may be inferred from the titles of a few recent papers, the contents of which are too technical to be outlined or abstracted here. Thus we have W. J. Spillman's "Application of Some of the Principles of Heredity to Plant Breeding" (Bull. 165, Bureau of Plant Industry, U. S. Dept. Agric.), covering 74 pages, with text, tables, diagrams and a full index. And next—E. M. East's "Distinction between Development and Heredity in Inbreeding" (*Am. Nat.,* 1909), followed by four papers by G. H. Shull, viz., "A Simple Chemical Device to Illustrate Mendelian Inheritance" (*Plant World,* 1909); "The Results of Crossing *Bursa bursa-pastoris* with *Bursa heegeri*" (Proc. 7, International Zool. Congress); "Inheritance of Sex in Lychnis" (*Bot. Gaz.,* 1910); "Color Inheritance in *Lychnis dioica* L." (*Am. Nat.,* 1910).

GENERAL NOTES

A YEAR or so ago Professor E. B. Copeland published as Bull. 24 of the Philippine Bureau of Education a suggestive pamphlet including first, an "Outline of a Year's Course in Botany in the Philippine Secondary Schools," and second, a "Key to the Families of Vascular Plants in the Philippine Islands." While especially helpful to the teachers on the islands, it will prove useful to many teachers in the United States.

Maiden and Betche's "Notes from the Botanic Gardens of Sydney, New South Wales," includes a number of descriptions of new species, and new localities of hitherto known species. Two good plates accompany the paper.

New parts of Karsten and Schenck's "Vegetationsbilder" (Gustav Fischer, Jena) include very different types of vegetation. Dr. Rikli, of Zurich, describes and beautifully illustrates the vegetation of Danish West Greenland, and F. Seiner, of Graz, does the

same for the dry steppes of the northern and middle Kalahari region in South Africa. The contrast between the two regions covered by these two Heften is most striking. The illustrations continue to maintain the high standard of excellence which they have shown from the beginning of the series.

Professor Hansen's bulletin on "The Wild Alfalfas and Clovers of Siberia, with a Perspective View of the Alfalfas of the World" (Bull. 150, Bureau of Plant Industry, U. S. Department of Agriculture) tells, first, of his several journeys into parts of Siberia, and then discusses quite particularly three Siberian alfalfas, viz., *Medicago falcata, M. platycarpa* and *M. ruthenica,* all of which are cultivated. Common alfalfa, *M. sativa,* and sand lucerne, *M. media,* are grown also, as are *M. glutinosa* and *M. arborea* (often 10 feet high) to a very limited extent.

Professor Gates attempts to make an analytical key to some of the segregates of *Oenothera* (Twentieth Annual Report of Mo. Bot. Garden), and succeeds in designating no less than twenty-two "species," beginning with *Oenothera biennis* of Linnaeus. The author finds it necessary to add one new species, *O. rubricalyx* which "originated as a mutant from *O. rubrinervis* two years ago." Surely we are making progress in regard to a practical acceptance of evolution!

"Some Unsolved Problems of the Prairies" are discussed, by Professor H. A. Gleason, in the *Torrey Bulletin* for June, 1909. He confines himself to the Illinois prairies where they "were converted into cornfields long before the development of ecology and phytogeography in America, thus forever prohibiting the satisfactory investigation of some questions of the most absorbing interest." The sources of information still available are enumerated, and then he discusses eight problems which have hitherto remained unsolved.

Allied to the last is Professor C. H. Shaw's paper on "Present Problems in Plant Ecology" in the *American Naturalist* for July, 1909, dealing very largely with those problems that develop in the study of alpine vegetation, including heat, precipitation, length of season, light and evaporation. Little more is attempted than the setting forth of the problems in a distinct form. At the close the author expresses the wish which every botanist will echo, "that some one whose knowledge of physics and physiology fits him for such a task should overhaul and scrutinize our ideas and methods," and a little later says "there can be no question that ecology at the present time contains not a little of discernible error." And to the latter there is a chorus of "amens" from scientific botanists everywhere.

The same author shows (in *Plant World,* August, 1909) that "timber-line" on high mountains is often due to the action of the snow.

Charles E. Bessey
The University of Nebraska

SPECIAL ARTICLES

ARTIFICIAL PRODUCTION OF MULTIVOLTINE RACES OF SILKWORMS

The domesticated moths known as silkworms have been the subject of much interesting observation and experiment in recent years. The work of Toyama,[1] Coutagne[2] and particularly that of Kellogg[3] in this country, has added much to our knowledge of the hereditary processes revealed by the manifold varieties of this insect. In a recent study Miss McCracken,[4] continuing the previous work in Professor Kellogg's laboratory, has studied the heredity of the race characters, bivoltism and univoltism, in the silkworm. By the former term is meant the condition by virtue of which two broods are produced annually, whereas in the univoltine form, but one brood is reared, the eggs laid in the spring wintering over and hatching out the following spring. This racial character being a physiological rather than a morphological one, is of peculiar interest in heredity.

The elaborate breeding experiments of Miss

[1] *Bull. Agricultural Coll.,* Tokyo Imp. Univ., VII., 1906.

[2] *Bull. Scient. de la France,* XXXVII., 1903.

[3] "Inheritance in Silkworms," *L. S. Jr. Univ. Pub.,* 1908.

[4] *Jour. Exp. Zool.,* 1909, VII., 747.